

REPORT OF
THE INTER-DEPARTMENTAL COMMITTEE
ON THE THIRD LONDON AIRPORT

*to the
Minister of Aviation*

June 1963

LONDON
HER MAJESTY'S STATIONERY OFFICE
1964

FOREWORD BY THE MINISTER OF AVIATION

This report is about the best way of meeting the long-term demands of air traffic on the London Airports—the main gateway to Britain. We have plans for the further expansion of Heathrow and Gatwick. But the day must come when they will be working at the limit of their capacity. A third major airport will then be needed for London.

The growth of international air services serving cities outside south-east England may take some of the load off London's airports. Improved techniques of air traffic control and new types of aircraft may add something to their capacity. Nevertheless, allowing for developments of this kind, the report reaches the conclusion that a third airport will be needed in about ten years' time.

We must ensure that this new airport is ready in time to take the traffic. But we are also concerned that national resources should not be invested too early. It is clear from the report that the time has come to start outline planning. Substantial expenditure on construction however need not be incurred until we can assess more accurately than at present the date when the other two airports will be saturated.

The choice of a site for a new airport will not please everyone. Wherever it is put, it will take away land that could be used for other important purposes. There are those who viewing the choice from the aspect of amenity alone would like to see it anywhere but in their own neighbourhood. Others will welcome it as near as possible to their factories or offices. The choice is limited by technical considerations. The report discusses these in detail. It concludes that Stansted Airport should be selected and designated as London's third airport. The Government believe that this is the right choice.

It is, however, only proper that all those likely to be affected should be given the opportunity to consider and discuss the reasons for the choice of Stansted. That is the primary purpose of publishing this report now.

Every effort will be made, in conjunction with the national and local authorities responsible, to ensure that the airport and its surface communications are developed to the best advantage of the travelling public. In particular, we shall consider closely the implications of this decision for communications between Stansted and central London and between the three London Airports. We shall also seek in accordance with the recommendations of the Wilson Committee on the Problem of Noise to reduce the impact of noise on residential areas near the airport.

I hope that there will be full public discussion of this report and I shall welcome constructive suggestions for making Stansted an efficient and attractive airport.



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COMPOSITION OF THE COMMITTEE

CHAIRMAN

Mr. G. V. Hole *Under-Secretary, Ministry of Aviation, Aerodromes (General) Division.*

OTHER MEMBERS

(Mr. P. C. Pinfield* Deputy Traffic Manager, British European Airways.)

{ Mr. A. E. Slocombe *Superintendent Air Traffic Services, British European Airways.*
Mr. L. C. Hunting *President for 1961 and 1962 of the British Independent Air Transport Association.*

Mr. S. G. G. Wilkinson *Assistant Secretary, Ministry of Housing and Local Government, Planning Division.*

Mr. R. H. Bird *Ministry of Transport, General Division.*

Mr. V. P. Harries, C.B. Under Secretary, Ministry of Aviation, London and Prestwick Airports Division.

Mr. R. S. E. Edwards, C.B.E. General Manager, London Airports, Ministry of Aviation.

Mr. G. S. Hill *Assistant Secretary, Ministry of Aviation, London and Prestwick Airports Division.*

Mr. A. H. Watson *Chief Statistician, Ministry of Aviation, Aviation Economics and Aircraft Branch.*

Sir John Briscoe, Bt., D.F.C. Director of Aerodromes (Technical), Ministry of Aviation.
Capt. V. A. M. Hunt, C.B.E. Director of Control (Plans), National Air Traffic Control
Service.

*Ministry of Aviation, Aviation Economics and Aircraft Branch.
National Air Traffic Control Services, Directorate of Control
(Planes).*

SECRETARIAT

Mr. D. C. Clark*

Mr. D. C. Ramage

Mr. R. E. Clarke

McIntyre of Aviation, London and Prestwick Airports Division.

Other officers from our respective organisations attended the Committee as advisers.

* Mr. Slocombe was appointed to the Committee from October 1962 in place of Mr. Pinfield. Mr. Clark resigned as Secretary on taking up a new appointment within the Ministry and was succeeded by Mr. Ramage.

Summary

OF REPORT AND RECOMMENDATIONS

	REFERENCE TO PARAGRAPHS IN FULL REPORT
THE NEED FOR A THIRD AIRPORT	
1. <i>Our forecasts show that Heathrow and Gatwick with two runways will from about 1972 be unable to handle all London's air traffic. London must, therefore, have a third airport by about 1973 if it is not to turn traffic away.</i>	10-14 (and Table I)
THE THIRD AIRPORT'S REQUIRED CAPACITY	
2. <i>The estimate of London's air traffic growth after 1970 shows that the new airport should have a potential capacity similar to that of Heathrow—i.e. a site has to be found where two parallel runways can be built far enough apart to permit independent operations on each.</i>	16-18
TYPE OF TRAFFIC USING THE THIRD AIRPORT	
3. <i>The new airport will be needed mainly for international short-haul passenger services, which account for the greatest proportion of aircraft movements. It should also be able to take the largest jets on long-haul services, including supersonic airliners, without creating intolerable noise problems. We worked on the assumption that passenger aircraft in use in the early 1970s, including the Anglo-French supersonic transport, would not make greater demands on airport facilities than those in use today.</i>	20 23 21-22
ROUTEING OF AIR TRAFFIC TO AND FROM LONDON'S AIRPORTS	
4. <i>Most of the airspace in the London area is at present required for the safe and rapid routeing of aircraft in and out of Heathrow and Gatwick. The third airport must be far enough away to allow all three airports to operate to their full capacities without imposing on aircraft serious delays or detours. If both Heathrow and the third airport are to be omnidirectional (i.e. to handle traffic to and from all points of the compass), the third airport will have to be more than 80 miles from central London—much too far for a "London" airport. Even if only one of the two is to be omnidirectional, the third airport must be at least 50 miles from central London—much more in some sectors—and this is still too far away. Eventually, therefore, neither Heathrow nor the third airport can be fully omnidirectional.</i>	31-32 33 34

ROAD AND RAIL ACCESS TO AND FROM CENTRAL LONDON

REFERENCE TO
PARAGRAPHS IN
FULL REPORT

5. Any London airport should be no more than an hour's journey from central London. The airline traffic, even at a major airport, is not expected to be sufficient on its own to warrant the expense of providing special access, other than a short link with an existing main railway line or road. A new airport must, therefore, be able to fit into the existing or already planned transport network for south-eastern England. There is at present no certainty that a fast and frequent connexion with central London could be provided solely or chiefly by rail; nor is it certain that, if such a connexion were possible, it could be run at a reasonable level of fares. Although, therefore, the possibility of a rail link is still open, the new airport should be placed where it can, if necessary, use the road system as its sole means of access.

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PROBLEM OF RECONCILING AIR ROUTEING CONSIDERATIONS WITH ADEQUATE GROUND ACCESS

6. The task is therefore to find within a reasonable distance of London a site for a new but not omnidirectional airport about as large as Heathrow. To the south and south-east the complex of routes serving Gatwick and the dense traffic between Heathrow and the Continent rule out the development of any major new airport. North-west of London, too, a new airport would obstruct the vital and busy air route between London and the North. To the west and south-west the nearest sites that could operate to the required capacity are at least 60 miles or more from central London and too remote. Only to the east and north-east could a third airport of Heathrow's capacity operate within a reasonable distance—down to as little as 30 miles—of central London. Due east, however, the irreplaceable firing range at Shoeburyness is an obstacle to flying, and a new airport would have to use much of its capacity for handling the traffic now using Southend. To the north-east, although there are disadvantages (e.g. a major airport there must affect military flying over East Anglia), it seems possible to achieve the requirement more nearly than in any other sector.

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32, 35, 45

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SITES EXAMINED

7. Over a dozen sites on the eastern and western sides of London have been examined in some detail. This study has confirmed that to the west there is no site of the desired capacity within adequate reach of London. To the east, Stansted, though not perfect, seems to be the only suitable site.

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STANSTED

REFERENCE TO
PARAGRAPHS IN
FULL REPORT

8. Stansted has important advantages over the other sites considered :
- (a) A satisfactory air route structure can be developed to allow both Heathrow and Stansted to operate to their full capacities. 62
 - (b) Part of the site, including a 10,000 ft. runway, is already in use as an airport. 61
 - (c) Parallel runways of the required length and separation (including one parallel to the existing runway) can be built in one of several orientations, some at least of which should not create a noise problem. 61
 - (d) Of the sites capable of development to the same capacity as Heathrow, it is nearest in distance to central London. 64
 - (e) With the building of M.11 by the early 1970s and completion of other planned road improvements in the inner London area, it will have good road access to central London—better than any other site capable of providing the required capacity. 64
 - (f) The area is in many ways suitable for a planned influx of population such as a major airport would inevitably attract. 63
9. There are the following disadvantages :
- (a) Stansted could not operate together with Heathrow to full capacity unless each airport was limited in the range of routes it could serve—but this applies to all other possible sites within at least 50 miles of central London. 66A
 - (b) The choice of Stansted would also reduce the amount of airspace available for military flying over East Anglia—but many others of the sites considered would, if developed, also interfere with military operations. 66B
 - (c) A substantial area of high quality agricultural land would eventually need to be taken over, not only for the development of the airport but for the housing, commerce and industry that would inevitably accompany it. 66C

But these drawbacks are outweighed by the advantages given in the previous paragraph.

MAIN CONCLUSIONS AND RECOMMENDATIONS

REFERENCE TO PARAGRAPHS IN FULL REPORT

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|--|------------|
| 10. (a) <i>London will need a new airport by the early 1970s.</i> | 14 |
| (b) <i>The new airport should be planned to deal ultimately with a similar level and type of traffic to that expected at Heathrow; it must, therefore, be able to have at least one pair of parallel runways.</i> | 18, 20, 23 |
| (c) <i>The new airport should be sited at Stansted, Essex.</i> | 68 |
| (d) <i>The road connexions between central London and the planned motorway, M.11, should be reviewed in good time to allow any changes to be implemented before Stansted's inauguration as the third London airport.</i> | 67A |
| (e) <i>The possibility of a rail connexion should be examined.</i> | 67B |
| (f) <i>The area should be surveyed so that a precise runway layout can be decided upon and the site and its approaches safeguarded as soon as possible against detrimental development.</i> | 67C |
| (g) <i>The planning of the airport should be part of a comprehensive scheme embracing housing and industry and taking particular care to avoid noise problems; any new residential development planned for the area should be made compatible with the airport.</i> | 67D |
| (h) <i>A study should be undertaken of Stansted's role and the routeing problems of the London area in the period between the opening of the third airport and the time when all three are running at their full capacities, so as to enable Heathrow to remain omnidirectional as long as possible.</i> | 67F |
| (i) <i>Search should be made for a training aerodrome eventually to replace Stansted.</i> | 67G |
| (j) <i>The question whether and where London should have a fourth airport should be taken up in about five years' time.</i> | 69 |

Report of the Committee on the Third London Airport

CHAPTER I

INTRODUCTION

TERMS OF REFERENCE

1. We were appointed on 21st November, 1961, to consider the requirements for a third London airport, including timing and location.

MEETINGS AND VISITS

2. We met eleven times up to 23rd May, 1963. Our advisers have visited the more promising of the short-listed sites (see Chapter V), and we ourselves have inspected Stansted.

WORKING GROUP

3. In order to assemble some of the more detailed information required on subjects such as air traffic routeing and road and rail access to the sites under consideration, a working group was set up under the chairmanship of Mr. D. C. Clark, succeeded by Mr. D. C. Ramage. It included representatives of B.O.A.C. and B.E.A. as well as the Ministry of Aviation. Representatives from the Ministry of Transport and British Railways attended certain meetings as advisers.

ACKNOWLEDGEMENTS

4. We should like to thank British Railways for supplying us with the information we needed. We are also grateful to the Ministry of Agriculture, Fisheries and Food, for giving us their views on certain matters.

5. We should like to pay a special tribute to our secretaries—Mr. Donald Clark, until he left the airports side of the Department for other work; Mr. Douglas Ramage, who succeeded him; and Mr. Roger Clarke; and to Miss M. H. Saxby, who also helped in the work. We could not have finished our work so expeditiously had it not been for efficient and able secretarial assistance. We are very grateful indeed to them for their excellent work.

HISTORICAL BACKGROUND

6. Ten years ago, in 1953, the then Ministry of Civil Aviation operated seven airports in the London area—Heathrow, Northolt, Blackbushe, Bovingdon, Croydon, Gatwick and Stansted. In order to provide a safe and efficient service for the steadily increasing air traffic, it was necessary to simplify the pattern of operations over London by concentrating traffic at fewer airports. The new system was described in the White Paper on London's airports (Command 8902) of July, 1953. Under the White Paper proposals Heathrow would for many years be able to deal with all London's forecast traffic except the summer peaks. The seasonal overflow and some charter operations would be handled at two other airports—a re-developed Gatwick (which was also to be the main diversionary airport for Heathrow in bad weather) and, in a supplementary role, Blackbushe. It was proposed to hold Stansted in reserve in case a further airport should be needed later. In 1960 Blackbushe was closed largely because its nearness to Heathrow produced insuperable air routeing difficulties: it held no prospect of economic development or of contributing significantly to London's airport capacity. But in other respects the system has remained as envisaged in the 1953 White Paper.

7. It has proved expensive to keep Stansted open as a reserve airport for London, although as much use as possible has been made of it for the training of airline crews, for trooping flights, and for the activities of the Ministry's Civil Aviation Flying Unit. The Select Committee on Estimates, in their Fifth Report for the Session 1960–61, concluded that the time had come to check that this expenditure was still necessary and to reassess whether Stansted was the most suitable site to hold in reserve. They therefore recommended that the Ministry of Aviation should undertake an immediate study of Stansted's prospects as a future third airport for London.

8. The Minister agreed with the Select Committee on the desirability of a decision on Stansted's future, and considered that sufficient information was now available for all those concerned to be able to embark on a fruitful study of the need for a third airport and of where it should best be sited. It is this study that we were asked to carry out.

LONDON'S NEED FOR AIRPORT FACILITIES UP TO 1980

THE NEED FOR A THIRD AIRPORT

9. We first considered whether and when a third London airport would be needed.

10. The capacities of Heathrow and Gatwick are given in section A of Table I. The capacity of an airport for incoming aircraft depends on the availability of sequencing and approach areas—i.e. airspace needed by aircraft for manoeuvre before coming in to land. It is reckoned that at London's airports one runway served by one sequencing area has a sustainable capacity of 16, or a peak capacity of 20, landings an hour. Allowing for take-offs we think it reasonable to assume for one runway a sustainable hourly capacity of 32 movements. Some American airports achieve higher movement rates than this by means of a more spacious runway layout; but comparison is difficult since so many factors are involved, such as the frequency of poor weather. In the airspace around Heathrow it has been found necessary to separate aircraft at all times by intervals appropriate to poor weather conditions. This considerably reduces the risk of collisions and "near-misses", which would otherwise be high in such a confined area of dense operations as the Heathrow control zone; but it has the effect of lowering the sustainable movement rate.

11. At Heathrow there are two main parallel runways, each served by a sequencing area, and if it is found possible to operate each of these runways independently the airport's hourly capacity can then be calculated by doubling 32. There is no room for a third sequencing area for Heathrow, and so the provision of a third parallel runway, even if it were desirable on other grounds, would not increase the airport's capacity by as much as a further 32 movements an hour. Gatwick has room for only one sequencing area because of its position in relation to Heathrow. Consequently, when the second runway is built, it will probably add no more than about eight movements an hour to the present capacity. There are nevertheless good reasons for building a second runway at Gatwick. A busy international airport, as Gatwick will increasingly be, needs to have more than one runway in case one is put out of action by, for instance, the need for major repairs.

12. Our forecasts of the traffic demand at London's airports (Heathrow and Gatwick) up to 1980 are given in section B of Table I. Further traffic forecasts will be found at Appendix A, together with the main assumptions underlying them. For convenience and clarity the figures in Table I have been given in precise terms, but we do not claim that they are more than approximations; this applies particularly to the figures for later years. Over short periods, too, the rate of growth of air traffic is sensitive to fluctuations in the national economy and in the international political climate for which it is impossible to make allowance in long-term forecasts. Nevertheless, although the forecasts are necessarily tentative, the uncertainty lies not in the volume of traffic growth but in its precise timing.

13. Up to 1970 our forecasts of traffic are based on detailed estimates. It was difficult to continue them on this basis beyond 1970 in view of the almost explosive growth of passenger traffic since the war and the knowledge that the rate of growth must eventually fall off. We therefore calculated the standard busy rates of traffic demand for London's airports after 1970 on the basis of a minimum rate of growth of aircraft movements that we were reasonably certain would be reached and would probably be exceeded. The rates of growth we used are given in section C of Table I.

14. From Table I it will be seen that by 1971 the standard busy rate of traffic demand at Heathrow—66 movements an hour in all—has passed the airport's sustainable capacity. If the excess of two movements an hour is transferred to Gatwick, that airport (with one runway) will then be running to its full sustainable capacity of 32 movements an hour. By 1972, therefore, a new runway will have to be provided for the London area either as Gatwick's second runway or as the new airport's first. The small amount of extra capacity provided at Gatwick by a second runway can be enough for only another year or so; by 1973 there will be an overflow of eight movements an hour at Heathrow, and this, added to Gatwick's own traffic demand in that year of 34 SBR movements, creates at Gatwick, too, a small overflow. On the basis of these figures, therefore, we believe that a third airport will be required for London in the early 1970s.

TABLE I
CAPACITY AND TRAFFIC DEMAND AT LONDON'S AIRPORTS 1963-1980

A. AIRPORT CAPACITY		B. TRAFFIC DEMAND		C. RATE OF GROWTH OF AIRCRAFT Movements in London Airports up to 1980	
Capacity of runways and their associated air traffic route structures at Heathrow and Gatwick		Estimates of traffic demand at London's airports Air transport movements (b) at the standard busy rate (c)			
Airport	Sustainable hourly rate (d) of aircraft movements	Year	Heathrow	Gatwick	Heathrow & Gatwick
Heathrow (assuming independent operation of the two main parallel runways)	64	1962	39	—	57
	—	1965	48	—	71
	—	1970	63	—	92
	—	1971	64	2	96
Gatwick (with one runway, as now)	32	—	—	—	—
	—	—	—	—	—
Gatwick (additional capacity from second runway)	8	—	—	—	—
	—	—	—	—	—
Total potential capacity of Heathrow and Gatwick	104	1972	64	5	101
	—	1973	64	8	104
	—	1975	64	16	106
	—	1980	64	33	104
	—	—	—	8	41

Note

- (a) The sustainable hourly rate is the highest rate of aircraft movements that an airport can take continuously, though a rate of up to 125 per cent of this may be attainable for short periods. It is the rate actually taken as representing the capacity of an airport.
- (b) An air transport movement is the arrival at or departure from an airport of an aircraft on public air transport operations, whether passenger or freight. The figures do not take account of movements of other kinds (e.g. training flights), since these may if necessary be restricted to off-peak periods.
- (c) This is normally equivalent to about 80 per cent of the peak hour figure for the year. The SBR is a useful measure of near-peak activity levels the eighth busiest hour.
- (d) The standard busy rate (SBR) is the hourly rate of traffic movement (passengers or aircraft) reached or exceeded on thirty occasions during the summer—in other words the customary used as the measure of demands in determining the desirable capacity for passenger buildings etc. in the same way as the sustainable hourly rate is used for measuring airport capacity (see Note (e) above).

15. It is interesting to compare our forecasts for Heathrow in Table I with those calculated in the mid-1950s for the Millbourn Committee. A comparison is set out in Table II.

TABLE II
COMPARISON OF CURRENT TRAFFIC FORECASTS FOR HEATHROW WITH THOSE OF THE MILLBOURN COMMITTEE
Air transport movements at the standard busy rate

Year	Millbourn Committee forecasts	Current forecasts
1960	39	37 (actual)
1965	63	48
1970	68-85	63

The recent forecasts are lower because we are now able to assume the use of aircraft with higher seating capacities, and because more peak-spreading has taken place than was allowed for in the Millbourn Committee's figures. In their report the Millbourn Committee recommended "that early consideration should be given to the possibility that yet a further airport will need to be developed by 1970 to meet the full requirement". This forecast was remarkably close.

THE POTENTIAL CAPACITY OF THE THIRD AIRPORT

16. By 1980 the total overflow from Heathrow and Gatwick will have reached an SBR of 40 or more. This can be taken as the minimum movement rate with which the third airport will have to cope in 1980.

17. Forty movements an hour is beyond the capacity of one runway. Even after a second runway has been built at Gatwick, therefore, two more runways will be needed for the London area by 1980. In our view it is essential to have them both at one airport. This is, in the first place, because two small airports would normally be more expensive to build and less economic to run than one of double the capacity; for instance, at the large airport it would be unnecessary to provide as much as twice the amount of concrete in the form of taxiways and aprons or to employ twice the number of staff on every branch of airport activity. Secondly, two small airports would entail greater fragmentation of operations: more airlines might have to run services simultaneously from more than one airport. This would be unwelcome to airlines and could be inconvenient to passengers wishing to change from one service to another. Thirdly, by reason of both the extent of London's built-up area and the great quantity of controlled airspace that each airport would require, the selection of a site with room for only one runway might well make it impossible to find an acceptable site of any kind for a large fourth London airport—and a fourth would in this case probably be required before 1980.

18. We therefore made it our objective to find a site where two parallel main runways could be built sufficiently far apart to ensure that each could be operated independently, thereby obtaining a potential sustainable capacity of 64 hourly movements. The site must also, of course, have room for the maintenance bases, car parks and other terminal facilities needed by this volume of traffic.

CHAPTER III

THE KIND OF NEW AIRPORT NEEDED

19. A third airport will, then, be needed by the early 1970s and it should be one capable of dealing ultimately with a sustained rate of 64 movements an hour. What else will be expected of it?

WHAT TYPE OF SERVICES?

20. Because short-haul services are likely to continue to constitute about 80 per cent of London's air transport movements, the third airport will clearly need to deal chiefly with these. Moreover, most of the short-haul services using the new airport will be international ones. Domestic services have for the most part the shortest stage lengths and are therefore the most sensitive to the length of the journey time between city centre and airport. Because Heathrow is likely to remain London's most accessible airport, the bulk of domestic services should remain there. Furthermore, only domestic services to the north of England, to Scotland and to Northern Ireland can provide the volume of traffic necessary to strike the right balance between northerly and southerly traffic at Heathrow. Without them Heathrow would inevitably be under-used.

21. Passenger aircraft in use in the early 1970s are not expected to make greater demands on navigational and airport facilities than those of today, though the facilities provided will, of course, continue to improve in efficiency.

22. The supersonic transport requires special consideration in this context. The major airlines of the free world and the International Civil Aviation Organisation, representing most of the world's governments with an interest in civil aviation, insist that the supersonic transport must be able to use the normal navigational and ground facilities in existence at the time of its introduction. We have therefore assumed as a basis for our studies that supersonic transports will require no more from navigational or ground facilities at airports than the most demanding subsonic aircraft that might still be in use at that time; thus, for instance, the runway length required by the Boeing 707 under worst conditions (about 12,000 ft.) is assumed to be enough for the supersonic airliner. (For the Anglo-French model, the Concord, it should be more than enough.)

23. Similarly, on noise, the international view is that supersonic transport aircraft should not cause more annoyance than existing jet airliners. The target of those working on the Concord is to meet or better this requirement, but it is too early yet for them to promise success. It may be that the supersonic transport will not give rise to a worse noise problem than that created by subsonic jets, and that it will accordingly be able to use Heathrow in common with them. On the other hand, in order to restrict noise, jet aircraft using Heathrow are even today subject at all times to operational limitations and in summer to restrictions on the number of night flights. By impairing their freedom of operations these restrictions cost the airlines money and adversely affect their service to the travelling public. We therefore felt that the third airport should be sited where both supersonic and subsonic jets could operate as freely as possible.

24. There is, of course, a possibility that services by helicopter or small fixed-wing aircraft may develop between the three airports. Provision both in the air traffic control system and at the airports should be made accordingly, in such a way that the airports' capacities for longer distance services are not affected.

WHAT DO OUR AIRLINES REQUIRE FROM THE THIRD AIRPORT?

25. The airlines' basic demands for a London airport are

ready access from London, and

the minimum of delays to flights from air traffic control or other causes.

They would also like to see good communications between London's airports.

26. B.O.A.C. and B.E.A. are strongly opposed to operating out of more than one London airport; in fact they wish to operate all services out of Heathrow. Both Corporations have invested large sums of money there in maintenance bases and other facilities. To be forced to duplicate these elsewhere, as well as staff, would be wasteful; but to operate services from the third airport while continuing to maintain aircraft at Heathrow would involve unproductive

flying between the two airports and would seriously raise costs. Such flights could also aggravate air routeing problems over London. Furthermore, the Corporations believe that if they moved some or all of their services from Heathrow they would risk losing most of their direct interline traffic* because of the inconvenience to passengers of having to travel from one London airport to another. Total interline passengers form roughly 15 to 20 per cent of the Corporations' traffic, and the discouragement of even some of this could mean a considerable loss of revenue.

27. British airlines agree, therefore, that Heathrow should ideally remain capable of serving routes in all the directions in which they run services, and that Gatwick and the third airport between them should also be able to serve all routes operated by foreign airlines, who would be displaced from Heathrow. They would thus like to see both Heathrow and the third airport capable of serving for as long as possible routes in every direction, that is, both airports omnidirectional.

* Interline passengers are all those who change on to another service for the next stage of their journey; some of these may call into central London for a few hours or a night. Direct interline passengers are those who change services without leaving the airport.

THE SITING OF A THIRD AIRPORT: GENERAL CONSIDERATIONS

28. The siting of London's third airport has to take account of the following points:

(a) *Routing of air traffic*

It must be possible to provide an efficient air traffic route structure allowing the new airport to function to its full capacity without hindering the other two from doing the same.

(b) *Volume of air traffic on different routes around London*

The new airport should not be placed where, because of air routing difficulties, it could serve only routes generating a small proportion of London's traffic. Otherwise a fourth airport might be needed prematurely to take traffic overflowing from Heathrow and Gatwick and unable to use spare capacity at the third airport.

(c) *Accessibility to central London by surface transport*

The airport must have, or be able to have, convenient and speedy facilities for direct travel to and from central London.

(d) *Terrain*

The terrain should have contours, soil, foundation and drainage such that an airport of the size and type needed could be built at reasonable cost.

(e) *Safety and obstructions*

The approach areas must be free from obstacles to flight and contain only sparse residential and working populations. The district must also be free from hazards to the landing and taking-off of aircraft and from anything that might prevent the installation of, or interfere with, the accurate operation of aids to navigation and landing.

(f) *Neighbourhood*

The new airport should interfere as little as possible with agriculture, local industry and the existing amenities of the neighbourhood.

(g) *Effects of aircraft noise*

The airport should be sited so as to disturb as few people as possible.

(h) *Nearness to centres of population*

So far as is consonant with (e) and (g) above, the airport should be near a centre of population large enough to supply the necessary labour and to provide the airport employees with the advantages of community life; or it should be in an area where there is scope for new residential and industrial development on this scale.

(i) *Weather*

The third airport should be sited where weather will hinder or prevent operations as seldom as possible. It would also be an advantage if the new airport could be sited where bad weather occurred at different times from bad weather at Heathrow or Gatwick, so that it was available for aircraft diverted from the other two.

(j) *Interests of other users of airspace*

The new airport should be sited so as to interfere as little as possible with airspace needed for other purposes, such as military, research or private flying.

(k) *Additional future airports*

The third airport should, as far as possible, be sited so as not to prevent the provision of further airports to serve London at a later date.

It was possible to study only (a), (b) and (c) usefully in general terms. The remaining considerations were taken into account when we examined specific sites.

(a) *Routing of air traffic*

29. The air traffic route structure over south-eastern England as it will probably be when Gatwick and Heathrow are running to capacity is shown in Map 1.
- (A) The *sequencing areas* (sometimes known as "holding stacks") are areas at which incoming aircraft may be made to circle during busy periods to ensure that aircraft come in to land at safe intervals, but at the same time regularly enough to make full use of runway capacity. These areas are also used to hold aircraft circling one above another when heavy traffic, weather, or other circumstances temporarily prevent landings (though with the increasing use of high-performance aircraft *high-level holding areas* will come to be used on these occasions). In this way aircraft do not normally need to be held en route, and far-reaching dislocation to other air traffic is avoided.
 - (B) The *approach paths* shown in Map 1 are the routes needed by aircraft under the worst conditions to get from sequencing area to runway. The length of the approach gives a pilot time to reduce height and to bring his aircraft to the point where he can turn onto the final landing path. The length can be varied in order to adjust the rate of flow of landing aircraft.
 - (C) The *airways* (Green One, Red One, Blue Twenty-nine etc.) are the controlled air corridors along which aircraft pass between one centre of air traffic and another. At present the base of an airway varies between about 2,000 ft. and 7,000 ft. above sea level, being in general lowest near the main aerodromes. The present airways ceiling is set at 25,000 ft.
 - (D) The *London terminal control area* (known as the London TMA) is the controlled airspace over London and the Home Counties reserved for the sequencing areas and approach paths of Heathrow, Gatwick and Southend Airports and including the airways themselves where they converge on London.

30. We made the following assumptions on air traffic routing:

- (A) There will be some improvements in air traffic control techniques over the next fifteen years.
- (B) Independent operation of Heathrow's parallel runways will prove practicable and there will be some extension of the London TMA to the west. Without these two developments Heathrow's sustainable capacity could not rise from its present 48 hourly movements to its potential of 64.
- (C) The volumes of the main air traffic streams to and from London will remain in broadly the same proportions to one another as at present (see paragraph 37), and consequently the pattern of air traffic routes radiating from London will remain much the same.

Because of the prevailing wind direction over south-eastern England the main runways at the new airport should be aligned in a broadly westerly or south-westerly direction; otherwise the regularity of operations is liable to suffer excessively as a result of high crosswinds.

31. The chief problem with finding a site for a new airport is that if it is to be near London its own route pattern will inevitably conflict with those of Heathrow and Gatwick. For example, if there were a new airport fairly close in to the east of London its traffic could not be routed on to a westerly air route without either

- invading the airspace already occupied by the sequencing areas and approach patterns of the other two airports, or
- crossing the air routes radiating from these two airports.

Of these possibilities the first is clearly out of the question in view of the increasing density of traffic using Heathrow and Gatwick. The second could be arranged either

- by controlled crossings, which, like traffic lights on roads, are liable to cause delays and result in a loss of capacity to the airports concerned, or
- by taking one route over another; but this in many cases is possible only by making one aircraft perform a detour in order to gain the height it needs to climb above another's path (thus creating the need for additional controlled airspace), or by forcing an aircraft to fly low for a protracted distance (which could extend the noise problem). Both courses are disliked by the airlines because they would increase operating costs.

The nearer the new airport is to London, therefore, the more restricted must be the range of routes it is capable of serving and the more it limits Heathrow's freedom of operations. The extent of these limitations depends also on the new airport's size and the intensity of its operations.

32. Initially, we worked on the basis that Heathrow must continue to serve all air routes, with Gatwick taking chiefly southerly traffic. This led directly to the conclusion that, because the London TMA was already almost fully taken up by the routes and landing patterns serving Heathrow and Gatwick, no new airport of the required capacity could be sited beneath it. It has also been clear from the beginning that the controlled airspace to the south and south-east of the TMA—i.e. between Green One (east) and Amber Twenty-six—is in use to an extent that would preclude the development of a new large airport in this area. The same is true of the region beneath the important air corridor to the north-west of London, which carries not only traffic to and from the north of England, Scotland and Northern Ireland, but also a good deal of transatlantic traffic.

33. We first studied the possibility of finding a site for the new airport so that both it and Heathrow could be omnidirectional. A new omnidirectional airport must, by definition, be able to handle traffic coming from all directions, even if this means flying across London. To do this without penalty to its own or to the other London airports' traffic, it must be sited so as to allow aircraft enough distance to reach a sufficient height to overfly the TMA. As a broad indication of what this means, it is estimated that to clear the sequencing areas at Heathrow and Gatwick an overflying aircraft should be at a minimum height of 15,000 ft. Thus the nearest point to the London TMA at which a fully omnidirectional airport can be sited must be at the minimum distance needed by typical airliners of the future to reach 15,000 ft. On the basis of information supplied by the airlines on the rate of climb of such aircraft as the VC10 and Trident on typical stage lengths, we consider a reasonable distance to allow is about 57 statute miles from the TMA. The effect of this can be seen at Map 2. Even allowing for the theoretical nature of the exercise, we concluded that a second fully omnidirectional airport adding 64 movements an hour to London's total sustainable capacity could not be sited within a reasonable travelling time of central London.

34. We also considered the possibility of a new sectional airport, that is, not omnidirectional but capable of serving traffic in certain sectors only (as Gatwick will be in the future), sited so that Heathrow could remain omnidirectional. As one moves inwards from the inner limit for an omnidirectional airport shown in Map 2, the range of directions that can be served easily from the new airport becomes more and more restricted. But one cannot move very far inwards before any major new airport with a sustainable capacity of 64 hourly movements would begin to interfere with the routes serving Heathrow: the factors described in the preceding paragraph that would keep a new fully omnidirectional airport beyond line A in Map 2 tend to apply similarly to the preservation of Heathrow's omnidirectional route pattern. As a result of the exercises we undertook we were satisfied that, if Heathrow was to have the ability to serve routes in all directions at a rate of 64 movements an hour, a second airport of similar capacity, even a sectional one, could not be sited within 50 statute miles of central London and in terms of conventional means of surface transport would be much too far out for a "London" airport.

35. This discouraging picture led us to consider the problem afresh by assuming neither Heathrow nor the third airport to be omnidirectional. In this way a new limit can be drawn if one uses as a datum the sequencing and approach areas of Heathrow and Gatwick and no longer takes for granted the present pattern of routes radiating from them. The result is a little more promising, particularly on the east side of London (see Map 2). This limit may be taken as the innermost for any kind of new airport with a pair of fully usable runways that will not interfere with the capacities of Heathrow and Gatwick. To the north, however, the line is not altogether realistic since an airport situated here would have to accept all domestic traffic between London and the North. We have already said that Heathrow should continue as the main terminal for London's domestic traffic (see paragraph 20).

36. The application of these studies is discussed in detail in Chapter V; meanwhile we make a few general remarks on some of the other considerations.

(b) Volume of air traffic on different routes around London

37. It was necessary to ensure that a third London airport with a sustainable capacity of 64 hourly movements would not be sited where, because of air routing difficulties, it could serve only a sector generating an insufficient share of traffic. For this purpose we calculated the volume of air traffic passing along each of the airways around the TMA during a sample week at the peaks of two consecutive years—in August 1961 and July 1962. The result for 1962 is given in Map 3, the traffic volumes being expressed separately as percentages of the total inbound and outbound movements. The two weeks examined show no marked discrepancy, and we have been unable to find any indication that the proportionate traffic volumes are likely to change significantly in the foreseeable future. For the most part they reflect this country's

geographical situation and the fact that short-haul routes tend to generate higher frequencies than long-haul. We therefore felt it reasonable to assume that the percentages shown in Map 3 will remain much the same.

(c) *Road and rail access*

38. We were agreed that no site outside one hour's journey of central London should be considered unless there was shown to be no alternative. Studies carried out for the Committee on the Planning of Helicopter Stations in the London Area indicate that just over half the air passengers departing from Heathrow start their journeys from central London or pass through it on their way to the airport. The majority of these passengers come from the main hotel areas in the West End; the other principal sources are the main line railway stations and the City. The centre of gravity of this passenger traffic is found to be in the neighbourhood of Grosvenor Square, and we have made this our measuring point for journey times between central London and the sites we have considered.

Access by road

39. The Ministry of Transport told us that by their usual criteria for the provision of new roads the amount of traffic using a third airport with twin runways (which will be ultimately about as much as that using Heathrow) would not justify a special new road, except possibly a short spur. Unless, therefore, we are to add the cost of a major new road to that of the new airport, there is no alternative but to endeavour to fit the new airport into the already planned road system for south-east England.

40. The planned radial road system out of London is shown in Map 4. Plainly the best prospects for a fast road connexion to central London are from a site close to a motorway. The Ministry of Transport have given us figures of current road travelling times and rough indications of improvements expected by the early 1970s. It has proved very difficult for them to forecast with precision the likelihood and extent of reduced travel times so far into the future since it is impossible to be certain how far the effect of planned road improvements will be offset by other factors such as the increasing volume of traffic. Map 5 gives the road system for inner London with proposed routes between central London and motorways M.4 and M.11; it also shows the path of the new Victoria line.

Access by rail

41. Here, too, we were told by British Railways and the Ministry of Transport that any special kind of airport rail service requiring the construction of new track for more than a few miles would probably be uneconomic to provide and run. The chief difficulty is that the volume of traffic generated even by a large and busy airport would, by itself, probably be insufficient to cover the capital and running costs at normal fare levels either of a traditional railway service or, on present knowledge, of other methods of rail transport such as the monorail or hovertrain.

42. We have therefore investigated the possibility of fitting an airport rail connexion into the pattern of existing services. For instance, we have looked to see whether a new airport could be served by a line out of Victoria Station, which has been suggested as a site for a main central London terminal for airlines. The problem is to obtain a service that is fast, frequent, and yet inexpensive. It may be that in the future the railways will be able to provide this, but there are difficulties. For example, some lines are already congested at peak periods with season ticket traffic, and on some others it would be almost impossible to make an airport service of the required frequency economic. Most of the main line termini are not conveniently placed for the chief air traffic generating area of central London—the West End. Paddington is one of the most accessible, yet even here the criterion of "within an hour of central London" (interpreted as Grosvenor Square) would allow no more than, say, 45 minutes for the train journey between Paddington and the airport.

43. Some of these difficulties may in time prove surmountable, but the possibility of providing a new airport with an adequately fast and frequent service at reasonable prices is not certain enough to justify the choice of a site whose only or principal connexion with central London would be by rail. We therefore could not treat the availability of rail transport as a determining factor in the choice of London's third airport.

CONSIDERATION OF SPECIFIC SITES

44. We began with a list of over a hundred places around London, regardless of their present ownership or use, which had at some time been used or considered for aerodromes; also included were a few new localities that we thought worthy of examination. We were able to shorten the list by the exclusion of areas in the north-west, south and south-east already eliminated on air traffic routeing grounds (see paragraph 32), though we mention below one northerly site, Luton, because it has been canvassed as a possible third airport for London. Many of the remaining sites were obviously unsuitable because of their small size or because they were already built on. We were thus left with under twenty localities for detailed examination.

LUTON

45. Luton Airport has often been suggested as a promising candidate for a third London airport: it is already operating and lies close to M.1, which gives it very good road access to north London. A major airport able to sustain a rate of 64 hourly movements could not, however, operate there without depriving Heathrow of its northern sequencing area, which would have the effect of cutting its capacity by nearly a half. Apart from this, a major airport at Luton would obstruct Heathrow's traffic routes to and from the north and thus prevent it from easily serving domestic traffic. We have already explained why this would be undesirable (see paragraph 20). Moreover, a pair of runways of sufficient length for a major airport could not be built there because of the hilly terrain. We therefore conclude that Luton would not be a good site for a third London airport.

WESTERLY SITES

46. Because of Heathrow's position the area of search for a third airport to the west of London has to be farther west than it would be otherwise. The places we selected for consideration (see Maps 2 and 4) are as follows:

Upper Heyford

Fairford

Brize Norton

Denchworth

Lambourn district

Andover district

Boscombe Down (considered only on the hypothesis, which it proved unnecessary to verify, that its present role as an aeronautical research and development airfield could be dispensed with)

Hurn

A detailed description of each of these will be found in Appendix B.

47. Since the nearest suitable area for a new airport from an air routeing point of view lies 60 or more miles from central London (see Map 2), there is little chance that any site will be within an hour of London by road. The best road access would be by M.4, the line of which is not yet fixed. This motorway has the advantage that it will penetrate into London as far as Chiswick and will be connected to the West End by a faster route than most other motorways (see Map 5). It could also provide a useful link between a third London airport and Heathrow. The high cost of fares by road or rail to and from such distant sites would, however, be an unfavourable factor, especially for short-haul services.

48. An airport on this side of London could easily serve supersonic transports on transatlantic routes. Moreover, between lines A and B on Map 2, many sites could permit almost omnidirectional services by high performance aircraft on long stage lengths since east-bound services, for example, could by flying south over the Channel gain enough height to overfly Heathrow's and Gatwick's southern and south-eastern routes. Heathrow would at the same time be able to serve all but those westerly routes using airway Green One.

49. Solely on air routeing grounds all the sites listed in paragraph 46 with the exception of Upper Heyford would theoretically be suitable for an airport with a capacity of 64 movements an hour. Hurn, indeed, is virtually far enough out to be fully omnidirectional without interfering with Heathrow's present route pattern. However, if a site within line B on Map 2, such

as Denchworth, were chosen the runway direction in use at the new airport would have to be co-ordinated with that in use at Heathrow. This would involve an undesirable loss of flexibility in the system and the risk of protracted delays to flights whenever the runway direction in use at one of the airports had to be changed.

50. But there is an air routeing disadvantage from which all the sites in the above list would suffer. We have already said in paragraph 20 that the third airport must be able to take some of London's international short-haul services, but it is our view that all the westerly sites considered are too far from London for this. As much as 80 per cent of London's international short-haul passenger traffic travels in broadly the south-easterly, easterly or north-easterly sectors. If any of it was to operate from a new westerly airport, most of the passengers would have to start their journey by going 60 miles or so by surface transport away from their destination: this is obviously absurd. Moreover, the procedure described in paragraph 48 above would involve increases in route mileage unacceptable to short-haul airlines.

51. Even for long-haul operations, *Brize Norton*, *Fairford*, *Boscombe Down* and *Hurn* would not be accessible enough since there seems no prospect of bringing them within an hour's road or rail journey of the West End. The *Andover* and *Lambourn* districts have somewhat more promising access and are satisfactory for air routeing, but they afford no site suitable for the construction of a large airport. *Upper Heyford*, though very suitable for operations by the supersonic transport on transatlantic routes, is badly placed for the development of a good air routeing system in conjunction with Heathrow, nor does it have any special advantages that might outweigh this. *Denchworth* lies on the Paddington-Bristol main line and is within about 10 miles of a possible line of M.4. The construction of twin parallel runways should be practicable from an engineering point of view but would entail the demolition of some villages and the creation of noise problems. It could not, however, be within an hour's road journey of central London, and the rail time is hardly more encouraging. Even more serious is the fact that it is too far from London in the wrong direction to make a suitable airport for short-haul operations, and the cost of road or rail fares would make it unacceptable, except possibly for long-haul services. It is not even ideal for air routeing (see paragraph 49).

EASTERLY SITES

52. We selected a number of sites along line B in Map 2 with the object of finding the best balance between the demands of air routeing and the need for accessibility from the metropolis. The sites are as follows:

Cliffe	Shepperry
Southend	Foulness
Willingale	Boreham
Andrewsfield	Debdon
Stansted	

Detailed information is set out in Appendix B.

53. Although the nearest sites capable of taking 64 flights an hour are much closer to London than those on the west, a comparison of road journey times does not show such a marked difference, largely because our measuring point, Grosvenor Square, is well on the west side of central London, and more of the journey eastwards is through built-up areas. Map 4 shows that the districts with the best hope of improved journey times by road are those within easy reach of M.2 or M.11.

54. Our studies of air routeing problems have shown that all the sites examined on this side of London would, if operated as twin-runway airports, deprive Heathrow of its ability to serve regularly routes to the east and north-east of London. The more distant of these sites are less restrictive than the nearer ones; the nearest of all could not achieve 64 movements an hour without seriously reducing Heathrow's capacity.

55. There are also special air routeing problems on this side of London:

Military flying: An extension of controlled airspace northwards over East Anglia would seriously affect the present pattern of military flying there.

Shoeburyness: The scheduled danger area above the Shoeburyness firing range reaches to a height of 60,000 ft. and would seriously hamper or even prevent flying from sites in south-east Essex or north Kent. The War Office set up the range in the first half of the last century, and since then they have spent many millions of pounds on maintaining and developing it. It still plays an essential part in experimental work on munitions and is considered by the War Office as irreplaceable because it is unique in possessing a large area of hard, flat sand which enables shells to be recovered intact for examination.

Southend Airport: In some years' time operations at Southend, particularly of aircraft wishing to join the main air routes, might well be hindered if a new major airport were built on the east side of London. If the new airport were due east of London its effect on Southend would be serious and it would have to take over some part of Southend's traffic, thus partly at least defeating its own purpose: in 1962 the SBR of air transport movements at Southend was higher than at Gatwick, and Southend's traffic is expected to grow at a similar rate to traffic elsewhere in the country.

56. Of the north Kent sites, Cliffe could not add a sustainable rate of 64 flights an hour to London's total capacity. Sheppey is far enough from Heathrow to be free from this defect, but it will not be brought within an hour of the West End even when further improvements to A.2 are carried out. An airport here would conflict with the Shoeburyness firing range and would be incompatible with the continued existence of Southend Airport.

57. North of the Thames estuary, *Southend Airport* could take 64 flights an hour if adequate parallel runways were provided, but there is not enough land available for this, for the airport is nearly surrounded by residential development and already has a serious noise problem. Operations are bound to be hindered by the nearness of the Shoeburyness firing range, which also prevents development of a new runway in a direction that is otherwise the most suitable. Road access to central London would not be good enough for a major London airport. Further east, Foulness is suitably flat and sparsely inhabited, and aircraft might be able to take off and land over the sea. Its operation would conflict with the continued existence of the Shoeburyness range, inside which it lies, and would be incompatible with the use of Southend Airport. It would not, any more than the other easterly sites we have considered, permit Heathrow to remain omnidirectional if both airports were to support a full 64 flights an hour. Its greater defect, however, is access, which is inevitably worse than Southend's. As the information in Appendix B implies, it would be quite impracticable to bring it within an hour's road journey of the main traffic generating areas of central London.

58. Thus, although the Thames estuary in general might at first sight seem a likely area for an airport because of the stretches of flat, desolate marshland along its shores, the two foregoing paragraphs show that we could find nothing suitable there. In short, to the west of Southend and the Isle of Sheppey (within line B on Map 2) it would be impossible to build a large airport that would not conflict with Heathrow; and outside this line no sites could be found within an hour's journey of central London.

59. *Willingale* in mid-Essex is too close to Heathrow to increase London's total sustainable capacity by 64 movements an hour. Because of its position midway between A.12 and the line of M.11, its access will not benefit greatly from planned road improvements, and it is so far from the nearest railway line that rail access would be impracticable. Further out, *Boreham* could deal with the full number of flights that two runways would support. It has the advantages of a nearby town and nearness to both A.12 and a main railway line. Although the road journey to the West End now takes about 1½ hours, this will doubtless be reduced when A.12 is improved by the construction of dual carriageways from Gants Hill to Colchester; but this improvement will not bring the site within an hour of Grosvenor Square.

60. To the north-east of London, *Andrewfield* is practicable for air routeing, but access is poor. It lies some distance from both A.11 and A.12 and is farther from London than either Stansted or Boreham. If developed as a major airport it would seriously disrupt the present pattern of military operations over East Anglia. This drawback applies equally to *Debden*, and although a slightly freer routeing system might be possible here than at a site closer to London, there is little hope of its ever being within an hour's road journey of the West End.

61. *Stansted* has the advantage that much of the site is already in use as an airport, and it has a 10,000 ft. runway on a NE/SW alignment that can be extended. The provision of a parallel runway of up to about 12,000 ft. also seems practicable. The disadvantage of the present orientation is that if the airport were developed to operate with parallel runways a conflict with Heathrow's operations would be liable to occur from time to time; this could be avoided by a different runway orientation at Stansted, though at the risk of creating a noise problem in Bishop's Stortford, Stansted Mountfitchet and Great Dunmow. A different orientation would also mean the acquisition by the Government of a larger area of new land for airport purposes. Moreover, the existing NE/SW runway would not then be used to its full advantage. With the present runway alignment the airport is well placed to avoid acute noise problems. Meteorological records for recent years show that flights would be only slightly more subject to delays or cancellations at Stansted from poor visibility or low cloud than at Heathrow and Gatwick; furthermore, on 29 per cent of occasions when both the other London airports are unavailable for these reasons Stansted has been usable. Nor would the frequency of strong

crosswinds be excessive with a south-westerly or westerly runway alignment. To find the best runway layout would require further technical studies, but we are satisfied that pairs of parallel runways of up to 14,000 ft. long could be provided on several suitable alignments. Development of a major two-runway airport, whatever the alignment, would mean that some of the airspace to the north and east of Stansted now used for military operations would then have to be taken over for civil use.

62. With Stansted as the third London airport, an air route structure could be devised to allow Heathrow and Stansted to operate to their full runway capacities (see Map 6); but for the reasons given in paragraphs 31 to 35 we do not see how Stansted could be operated with two runways (and thus with two sequencing areas) without eventually depriving Heathrow of the ability to serve routes to the east and north-east. Omnidirectional flying from Heathrow should nevertheless be possible for a long time after the early 1970s and should be allowed to continue as long as possible.

63. Stansted is within a convenient distance of Bishop's Stortford, which today has a population of over 18,000 and lies in an area offering scope for large-scale population growth. The Ministry of Agriculture, Fisheries and Food, have pointed out that the development of an airport here, together with the associated industry and housing, would mean a loss of good agricultural land; but against this may be set the economic value of the new airport in promoting industry and in maintaining London's position as one of the chief air traffic centres of the world.

64. The construction of M.11 combined with other road improvements near the centre of London will by the early 1970s give this site the fastest road connexion with central London of all the sites we have studied that are able to increase the London area's sustainable capacity by 64 movements an hour. In fact, it appears to be the only one that will meet the criterion of one hour's travelling time from the West End. It may, too, have the advantage of being eventually within an hour of Heathrow, when London's D Ring Road is built. Stansted is well placed for the provision of a rail link with the main Eastern Region line through Bishop's Stortford if it should ultimately prove justified; and if the need ever arose to build an entirely new connexion with London (e.g. by monorail), Stansted as the closest of the practicable sites would be the most convenient for such a connexion. Its promise of reasonably good access and its favourable geographical position for services to the Continent would make it more acceptable to airlines running short-haul services than any new site to the west of London.

CONCLUSION

65. Stansted clearly has a number of important advantages which may be summarised as follows:

A satisfactory air routeing system appears possible.

Not only can a parallel be built to the existing runway, but parallel pairs of runways, with adequate length and separation, can also be built in other directions.

A fast road connexion with London is already planned.

Compared with the other sites considered it is near to London.

There is scope in the neighbourhood for the additional population that the airport would generate.

The site is already in use as an airport.

For these reasons we have no doubt that Stansted is the best of the sites that we have examined and the only one with a clear prospect of making a successful third London airport.

66. The site is not ideal, but this is hardly surprising when, as in this case, the field of choice is so narrow. In particular, the selection of Stansted must be subject to the following qualifications:

- (A) If, as we think (see paragraph 62), a route structure on the lines of that in Map 6 has to be adopted so that both Stansted and Heathrow can operate simultaneously to their full capacities, then Heathrow, as well as Gatwick and Stansted, will eventually cease to be omnidirectional. This is a serious disadvantage; but we must emphasise that it would apply to a greater or lesser extent to nearly all the sites we have considered, indeed to any site within about 50 miles of London (see paragraph 34). Nevertheless, the fact that Heathrow cannot remain omnidirectional when London's three airports are operating to capacity need not affect plans for developing a major air freight terminal at Heathrow, since all-freight services allow greater freedom in scheduling and routeing than passenger flights and may thus be able to operate indefinitely in all directions from Heathrow.

- (B) It must be accepted that Stansted's development as a major airport would ultimately result in the allocation to the new airport of some airspace north of airway Red One (east). Currently this airspace is largely used by civil and military operators not using London's airports. The development of Stansted will require the resolution of the present conflict between the airport and nearby military airfields, the provision of some approved access from the east and north-west, and the formation of a control zone similar to that safeguarding Gatwick. The full effect on airspace of Stansted's operations will not, however, be felt until, some years after it has come into use as the third London airport, the growing traffic requires a parallel runway system, that is, probably not before the late 1970s. The implications of feeding this sort of traffic into East Anglia progressively over a number of years are now being studied by the National Air Traffic Control Services with the object of planning to minimise the effect of the airport on military air traffic.
- (C) It must also be accepted that land around Stansted, of good agricultural quality, will be needed not only for the expansion of the airport but also sooner or later for the industry and housing that will inevitably accompany it.

67. Stansted's selection would have the following implications:

- (A) There are already improvements planned for the main road communications between M.11 and central London (see Map 5 and explanatory note). Existing plans and their timing should be reviewed to see whether additional improvements or acceleration would be justified by the volume of airport traffic; this review should be carried out in time to allow any consequent adjustments in the programme to be implemented before Stansted comes into operation as the third London airport.
- (B) There should be a review of the feasibility of some form of rail link to Stansted. The possibility of using the new Victoria line for part of the journey, and of carrying passengers between, say, Tottenham Hale station and the airport by coach, should also be explored—particularly since Victoria is already a centre for airlines' town terminals (e.g. B.O.A.C.'s and B.U.A.'s) and may become more so in the future.
- (C) As soon as the site has been surveyed, a plan for laying out Stansted's runways must be drawn up so that

operations will suffer the least possible interruption on account of crosswinds; the alignment chosen will not, by causing a conflict of approach paths with Heathrow, seriously reduce the combined capacities of the two airports on a significant number of occasions in the year; Bishop's Stortford and other large communities nearby will not be subjected to discomfort from the noise of aircraft using the airport; and civil engineering work is minimised, since the land is by no means as level as, for instance, at Heathrow.

Then the runways and approaches should be safeguarded from conflicting development.

- (D) An enlarged airport at Stansted would inevitably stimulate residential development in the area. The airport itself might ultimately employ some 7,000-10,000 people; if allowance is made for families and for employment created indirectly by the airport, a population growth of between 25,000 and 50,000 could well be expected. In addition to this, the airport, together with the new motorway, would greatly enhance Stansted's attractiveness as an area for the development of commerce and industry and would make the locality a strong candidate for a planned increase in population on a larger scale. This in turn would greatly benefit the airport. The selection of Stansted would provide an excellent opportunity for the co-ordinated planning of the airport and nearby residential and industrial zones so as to avoid the noise problems that have created so much difficulty at Heathrow.
- (E) The effect of a major airport at Stansted on Southend and Luton Airports' operations must not be overlooked. Our present information indicates that they would continue to be able to serve freely traffic not wishing to join the main air routes, but at both these airports the growth of traffic using the main air routes would eventually have to be curbed, so that London's major airports could cater efficiently for their own traffic demand. Moreover, as Heathrow, Gatwick and Stansted became more restricted in the range of routes each could serve, Southend and Luton would become similarly unable to serve traffic in every direction. The position of Luton in relation to Stansted could mean some additional limitation on Luton's traffic, but the nature of this would

be quite uncertain until Stansted's runway layout was decided and until further technical studies had been undertaken. The existence of Heathrow will, in any case, by itself prevent the growth of Luton's traffic beyond a certain point.

- (F) We have ourselves made a study of the feasibility of a three airport system for London when all three are running to capacity, assuming Stansted to be the third airport (see Map 6). A further study should soon be made of possible routeing systems in the London area and of the likely role of Stansted in the period between the start of the overflow from Heathrow and Gatwick and the final stage envisaged in Map 6. This study should, of course, take account of the position of British operators based at Heathrow.
- (G) Since much of the airlines' flight training currently takes place at Stansted, another base for this would have to be found in time.
68. The qualifications to Stansted's suitability set out in paragraph 66 above would also apply to a greater or lesser extent to other eligible sites. It remains our belief that Stansted is the best of the sites that we have considered and, in view of the time scale for its development, the only one with clear prospects of making a good airport for London. We are accordingly unanimous in recommending Stansted as the site for London's third airport.

POSTSCRIPT ON THE FOURTH LONDON AIRPORT

69. In paragraph 16, we forecast that the third London airport would be required to handle an SBR of 40 or more flights by 1980. If the same trends of traffic growth continue it may not be many years after that before a fourth London airport is needed. It has become very clear during our search for a suitable third airport that the number of practicable sites for a new London airport is severely limited and will become even more so after the third has taken over a further block of airspace. There is, too, a danger that, at the present rate of urban and industrial expansion in south-east England, any suitable sites for a fourth airport may be lost in the coming years through ignorance of their potentialities and of the need to preserve them. On the other hand, we are very conscious of the uncertainties about the nature and pattern of London's air transport as far ahead as the 1980s. Although we have not felt able to assume the advent over the next decade of commercially operable vertical or short take-off airliners, or of helicopters suitable for widespread use in public transport, such aircraft may well be available by the 1980s. By this time, too, the pattern of air services over Britain may have changed, with less centralisation of routes on London and many more direct services between the provinces and the Continent. We believe that in our present uncertainty it would be premature to recommend that a site should be reserved now for a fourth London airport; the question should rather be looked at again in about five years' time, when the future may be clearer.

APPENDIX A

SUPPLEMENTARY TRAFFIC FORECASTS: ASSUMPTIONS
ON WHICH FORECASTS ARE BASED

TRAFFIC ESTIMATES 1962 TO 1970: ANNUAL TOTALS

1. (a) Passengers:

		Heathrow	Gatwick	Total for London area
1962 (actual)	..	6,812,033	1,042,420	7,956,053*
1965	..	9,800,000	1,600,000	11,400,000
1970	..	15,000,000	2,400,000	17,400,000

(b) Air transport movements:

		Heathrow	Gatwick	Total for London area
1962 (actual)	..	145,830	26,067	172,915*
1965	..	172,000	38,000	210,000
1970	..	229,000	50,000	279,000

ASSUMPTIONS UNDERLYING OUR TRAFFIC FORECASTS

2. The forecasts up to 1970 at Table I in Chapter II of the report and in the first section of this appendix are based on the current rate of growth of total passenger travel and on air travel's increasing share of the total. They assume, among other things, a gradual decrease in the rate of growth of air passenger traffic, but it is very difficult to forecast exactly the rate of decrease or the ultimate level of traffic growth. The forecasts also provide for a substantial growth in freight traffic, by a big increase both in freight carried on passenger aircraft and in all-cargo operations, mainly in off-peak periods. Allowance has been made for the possibility of peak-spreading (i.e. the spreading of services more evenly throughout the day, week and year) in the forecasts for Gatwick, where services are at present intensely seasonal. But at Heathrow, services have already been spread more extensively, and there is little scope for further peak-spreading as far as passenger services are concerned: the public will inevitably continue to find certain hours, certain days and certain months more convenient or more pleasant for travel than others, and the scheduling of services by competing airlines is bound to reflect these preferences.

3. Our forecasts of traffic after 1970 take account of the same factors, but instead of aiming for the actual figures we have used a low rate of growth that we are almost certain will be reached and we expect will be exceeded (see paragraph 13).

4. We also considered whether we should make allowance in our traffic forecasts for the increasing use of the helicopter, for the development of a vertical take-off airliner or for the construction of a Channel Tunnel or Bridge.

(a) Helicopters

The degree to which scheduled services by helicopter will develop in this country is not yet known, and we have accordingly made no allowance in our forecasts for their introduction. The volume of helicopter traffic in the London area within the period of our forecasts is likely to be very small in comparison with our estimates of 17 million air passengers in 1970 and perhaps as many as 35 million by 1980. The Committee on the Planning of Helicopter Stations in the London Area, on the assumption of operations with the Rotodyne, forecast London's total helicopter traffic in 1970 as 900,000 passengers. With the demise of the Rotodyne and with no immediate prospects of a comparable successor, even this figure cannot be reached until after 1970.

(b) Vertical take-off airliners

We consider that there is no prospect that a civil transport aircraft of this type will come into regular operation by the beginning of the next decade. Its introduction even after 1970 is, as with helicopters, still uncertain owing to problems of noise and the heavy cost of operation. We therefore decided not to make allowance for it in our proposals covering the next 15 years or so.

* The totals for London area for 1962 include the small volume of traffic at Stansted.

(c) Channel Tunnel or Bridge

From the evidence so far available it seems unlikely that traffic would be diverted from the air to a Channel Tunnel or Bridge to an extent that would significantly affect the need for a third London airport. In the case of Heathrow and Gatwick the only passenger services likely to be affected to any degree would be those to nearby Continental cities such as Paris and Brussels, and the extent of any such diversion from air to surface transport would probably not be significant against the annual totals of air passengers that we have been considering.

DETAILED INFORMATION ON SITES CONSIDERED

Notes

(i) Distances (given throughout in statute miles) and road journey times out of London are measured from Grosvenor Square.

(ii) Road journey times are all average times in current conditions.

(iii) Only those towns considered best able to provide labour and living amenities have been included under headings (d). Population figures are those of the provisional findings of the 1961 census; they are given to the nearest thousand.

1. LUTON

- (a) Description of site ... Municipal aerodrome.
- (b) Approximate distance from London. 27 miles direct, 30 miles by road.
- (c) Access from London ... By road: over 1 hour by M.1. Likely to be reduced with extension of M.1 to inner London.
By rail: 38 minutes from St. Pancras. Fairly frequent service.
- (d) Nearest towns ... Luton (population 132,000) 2 miles to WNW by road.
- (e) Runway possibilities ... Impracticable to construct twin runways of sufficient length for major airport.
- (f) Compatibility with Heathrow and Gatwick. A major airport at Luton could not sustain 64 movements an hour without seriously curtailing Heathrow's capacity.

2. UPPER HEYFORD

- (a) Description of site ... Active military airfield.
- (b) Approximate distance from London. 57 miles direct, 62 miles by road.
- (c) Access from London ... By rail: the nearest main line station is Bicester North and the present journey time from Paddington is 56 minutes. Best time foreseen is 53 minutes.
- (d) Nearest towns ... Oxford (population 106,000) 12 miles to S by road.
- (e) Compatibility with Heathrow and Gatwick. Unsuitable for 64 movements an hour because of conflict with routeings from Heathrow.

3. FAIRFORD

- (a) Description of site ... Active military airfield.
- (b) Approximate distance from London. 73 miles direct, 80 miles by road.
- (c) Access from London ... By road: 139 minutes.
By rail: a fast connexion is impracticable.
- (d) Nearest towns ... Cirencester (population 12,000) 8 miles to W by road.
Swindon (population 92,000) 10 miles to S by road.

4. BRIZE NORTON

- (a) Description of site ... Active military airfield.
- (b) Approximate distance from London. 65 miles direct, 76 miles by road.
- (c) Access from London ... By rail: a fast connexion is impracticable.
- (d) Nearest towns ... Witney (population 9,000) 5½ miles to NE by road.

5. DENCHWORTH		
(a) Description of site		New site. Grass and arable.
(b) Approximate distance from London.		58 miles direct, 62 miles by road.
(c) Access from London		By road: 115 minutes. Access will eventually be by M.4, which may well pass within about 9 miles of the site. M.4's route is not yet decided. By rail: on main Paddington to Bath line. A journey time of 50 minutes from Paddington to the site should become possible by the 1970s.
(d) Nearest towns		Abingdon (population 14,000) 8 miles to NE by road. Oxford (population 106,000) 12 miles to NE by road. Swindon (population 92,000) 15 miles to SW by road.
(e) Runway possibilities		E/W parallel runways could be provided with adequate separation.
(f) Compatibility with Heathrow and Gatwick.		Suitable for airport with capacity of 64 movements an hour. Access to or from E and SE would probably be impracticable for short- and medium-haul aircraft. Landing and take-off directions would have to be coordinated with Heathrow's.
(g) Noise problems		Several small towns and villages might have to be demolished, and others might suffer badly from noise.
(h) Other considerations		Lyneham and Abingdon (military airfields) would be affected. The latter might have to be closed to all air traffic. In the vicinity there are areas where flying is restricted; this might well hinder use of the site.

6. REGION AROUND LAMBOURN

(a) There appears to be no suitable site in this area for a major airport.		
(b) Approximate distance from London.		61 miles direct, 68 miles by road.
(c) Access from London		By road: 125 minutes via Reading. A site in this area could be very near M.4 (route not yet settled)—thus perhaps under an hour to Heathrow but over an hour to Grosvenor Square. By rail: a journey time of 57 minutes between Paddington and Hungerford (7 miles south of Lambourn—nearest point on main line) should become possible.
(d) Nearest towns		Swindon (population 92,000) 12 miles to WNW by road. Newbury (population 20,000) 12 miles to ESE by road.
(e) Compatibility with Heathrow and Gatwick.		An airport with a capacity of 64 movements an hour could operate here. Access to or from E and SE would probably be impracticable for short- and medium-haul aircraft. One of the closest points to London on the western side for an airport with a sustainable capacity of 64 movements an hour that could function quite independently of Heathrow.

7. REGION AROUND ANDOVER

(a) There appears to be no suitable site in this area for a major airport.		
(b) Approximate distance from London.		63 miles direct, 67 miles by road.
(c) Access from London		By road: 130 minutes. By rail: best journey time foreseen between Victoria and Andover would be one hour.
(d) Nearest towns		Andover (population 17,000).

- (e) *Compatibility with Heathrow and Gatwick.* An airport with capacity of 64 movements an hour could operate here. Access to or from E and SE would probably be impracticable for short- and medium-haul aircraft. One of the closest points to London on the western side for an airport with a sustainable capacity of 64 movements an hour that could function quite independently of Heathrow.

8. BOSCOMBE DOWN

- (a) *Description of site* ... Active Ministry of Aviation aerodrome.
 (b) *Approximate distance from London.* 75 miles direct, 77 miles by road.
 (c) *Access from London* ... By rail: the best time foreseen is slightly over one hour from Victoria.
 (d) *Nearest towns* ... Salisbury (population 35,000) 8 miles to SSW by road.
 (e) *Compatibility with Heathrow and Gatwick.* Suitable for an airport with a sustainable capacity of 64 movements an hour. Access to or from E and SE would probably be impracticable for short- and medium-haul aircraft.

9. HURN

- (a) *Description of site* ... Ministry of Aviation civil airport.
 (b) *Approximate distance from London.* 92 miles direct, 99 miles by road.
 (c) *Access from London* ... By rail: the best time foreseen would be over 90 minutes from Victoria.
 (d) *Nearest towns* ... Christchurch (population 26,000) 4 miles to SSE by road.
 Bournemouth (population 154,000) 5 miles to SW by road.
 (e) *Runway possibilities* ... Provision of an adequate pair of runways is not practicable without clearance of a considerable residential area.
 (f) *Compatibility with Heathrow and Gatwick.* Suitable for a fully omnidirectional airport with a sustainable capacity of 64 movements an hour (but see (e) above).

10. CLIFFE

- (a) *Description of site* ... New site; marsh and poor quality grazing land with watercourses.
 (b) *Approximate distance from London.* 28 miles direct, 35 miles by road.
 (c) *Access from London* ... By road: 85 minutes by A.2. By 1970 the journey time will be reduced by further improvements to A.2.
 By rail: fast trains run hourly between Charing Cross and Gravesend taking 44 minutes. The branch line beyond Gravesend is only a single track. Between Gravesend and London the line is already congested. Trains could be brought into Victoria.
 (d) *Nearest towns* ... Rochester (population 50,000) 5 miles to SSW by road.
 Chatham (population 49,000) 6 miles to S by road.
 Gillingham (population 73,000) 7 miles to SSE by road.
 Gravesend (population 51,000) 7 miles to WSW by road.
 (e) *Runway possibilities* ... ENE/WSW parallel runways could be provided with 6,000 ft. separation.

(f) Compatibility with Heathrow and Gatwick.	An airport supporting 64 movements an hour would be impossible because of conflict with Heathrow.
(g) Other considerations	Shoeburyness firing range is approximately 12 miles to ENE of the site, and its associated danger area would adversely affect flying in the Cliffe area.

11. SHREWDEN

(a) Description of site	.. New site: marsh and poor quality grazing land with watercourses.
(b) Approximate distance from London.	45 miles direct, 53 miles by road.
(c) Access from London	.. By road: 103 minutes by A.2 and M.2. By 1970 the journey time will be reduced by further improvements to A.2. By rail: 85 minutes from Victoria to Queenborough; through trains run hourly but are not fast. Sheppeney is a better prospect than Cliffe for a link with Victoria, but it would take more than one hour.
(d) Nearest towns	.. Sheerness (population 14,000) 7 miles to WNW by road.
(e) Runway possibilities	.. ENE/WSW parallel runways with 6,000 ft. separation would be difficult but practicable at the eastern end of the island.
(f) Compatibility with Heathrow and Gatwick.	Probably suitable for 64 movements an hour but not to serve routes in all directions.
(g) Noise problems	.. Both extended runway centre lines would cross Sittingbourne (population 24,000) about 7 miles to SW.
(h) Other considerations	.. Flying from Shoeburyness range would hamper flying in this area.

SOUTHEND

(a) Description of site	.. Municipal airport.
(b) Approximate distance from London.	36 miles direct, 41 miles by road.
(c) Access from London	.. By road: over 1 hour. By rail: fast service (45 minutes) from Fenchurch St. to Southend-on-Sea runs half-hourly. Fast service (55 minutes) from Liverpool Street to Rochford runs hourly. Capacity not available for adequate frequency to serve major airport.
(d) Nearest towns	.. Southend (population 165,000) 2 miles to SSW by road.
(e) Runway possibilities	.. Owing to the built-up nature of this area it is clear that parallel runways of the length needed, with adequate separation, could not be provided without drastic demolition of housing.
(f) Compatibility with Heathrow and Gatwick.	With Shoeburyness firing range closed, probably suitable for 64 movements an hour but not to serve routes in all directions.
(g) Noise problems	.. Could not operate as a major airport without causing serious noise problems in Southend and neighbouring towns.
(h) Other considerations	.. Nearness of Shoeburyness firing range would seriously hinder operations.

13. FOULNESS

- (a) Description of site ... New site, flat, interlaced with ditches. Area covered by Shoeburyness firing range danger area.
- (b) Approximate distance from London. 46 miles direct, 52 miles by road.
- (c) Access from London ... By road: 88 minutes via Southend; from Southend via A.13 and minor roads to Foulness.
By rail: 55 minutes from Fenchurch Street to Shoeburyness; half-hourly service.
- (d) Nearest towns ... Southend (population 165,000) 11 miles to SW by road.
- (e) Runway possibilities ... WSW/ENE parallel runways could probably be provided with 6,000 ft. separation and unobstructed approaches.
- (f) Compatibility with Heathrow and Gatwick. Probably suitable for 64 movements an hour but not to serve routes in all directions.
- (g) Other considerations ... Southend Airport and Shoeburyness firing range would have to close.

14. WILLINGALE

- (a) Description of site ... Former R.A.F. airfield, since sold. Arable land.
- (b) Approximate distance from London. 23 miles direct, 30 miles by road.
- (c) Access from London ... By road: 68 minutes by A.11. By 1970 journey time will probably be reduced slightly with building of M.11.
By rail: a service is probably impracticable; the site is at least seven miles by road from the nearest British Railways line and three miles from the London Transport station at Ongar. The journey from Marble Arch to Ongar takes 70 minutes.
- (d) Nearest towns ... Chelmsford (population 50,000) seven miles to E by road.
Brentwood (population 52,000) nine miles to S by road.
- (e) Runway possibilities ... E/W parallel runways could be provided, but to obtain more than 4,500 ft. separation would be difficult and very expensive.
- (f) Compatibility with Heathrow and Gatwick. Could not support 64 movements an hour without serious conflict with Heathrow.
- (g) Noise problems ... Both E/W runways would point directly over Chelmsford.

15. BOREHAM

- (a) Description of site ... Former R.A.F. airfield. Sold for agriculture. Orchards, market gardens and arable.
- (b) Approximate distance from London. 33 miles direct, 36 miles by road.
- (c) Access from London ... By road: 83 minutes by A.12, which by 1970 will be improved though not to motorway standard.
By rail: 34 minutes from Liverpool St. to Chelmsford. A connexion to the site would be physically possible but extremely expensive, and it would be impossible to serve the airport during peak periods because the main line is already full to capacity.

(d) Nearest towns	Chelmsford (population 50,000) 4 miles to SW by road.
(e) Runway possibilities	E/W parallel runways could be provided with 6,000 ft. separation.
(f) Compatibility with Heathrow and Gatwick.	Probably suitable for 64 movements an hour but not to serve routes in all directions.
(g) Noise problems	There would be noise in some villages and perhaps in the northern suburbs of Chelmsford—e.g. Broomfield. The southern runway would probably point at Broomfield Hospital.

16. ANDREWSFIELD

(a) Description of site	Former R.A.F. airfield, since sold. Arable.
(b) Approximate distance from London.	36 miles direct, 46 miles by road.
(c) Access from London	By road: 106 minutes by A.12, which by 1970 will have been improved. M.11 when built might be considerably quicker. By rail: express trains between Liverpool Street and Bishop's Stortford take 37 minutes (20-minute frequency during rush hours, hourly or two-hourly at other times). Also semi-fast electric service taking 58 minutes (20-minute frequency during rush hours, 30-minute at other times). Further improvements to these services are planned. A single track branch line from Bishop's Stortford to Dunmow and Braintree, running close to the site, has been closed to passenger traffic, but its reopening is under examination.
(d) Nearest towns	Braintree (population 21,000) 4 miles to ESE by road.
(e) Runway possibilities	E/W parallel runways could be provided with 5,500 ft. separation. NE/SW parallel runways could be provided with 6,700 ft. separation.
(f) Compatibility with Heathrow and Gatwick.	Probably suitable for 64 movements an hour but not to serve routes in all directions.
(g) Noise problems	Use of southern of two E/W runways would involve flight over Bocking (northern part of Braintree) and over northern outskirts of Great Dunmow (population 4,000).
(h) Other considerations	Wethersfield (an active military airfield) is only 5 miles to NNE of Andrewsfield.

17. DEBDEN

(a) Description of site	R.A.F. airfield.
(b) Approximate distance from London.	37 miles direct, 43 miles by road.
(c) Access from London	By road: 95 minutes by A.11. Journey time will be reduced when M.11 is built. By rail: 54 minutes from Liverpool Street to Audley End via Bishop's Stortford (hourly during rush hours, hourly or 2-hourly at other times). Service would be improved in both timing and frequency if electrification were ever extended to Cambridge.

(d) Nearest towns	..	Saffron Walden (population 8,000) 2 miles to NW by road. Bishop's Stortford (population 18,000) 10 miles to SSW by road.
(e) Runway possibilities	..	ENE/WSW parallel runways could with difficulty be provided with 5,750 ft. separation.
(f) Compatibility with Heathrow and Gatwick.	..	Probably suitable for 64 movements an hour but not to serve routes in all directions.
(g) Noise problems	..	Newport (population 1,000) 2 miles to W would suffer from noise, as would possibly Saffron Walden.

18. STANSTED

(a) Description of site	..	Ministry of Aviation civil airport, surrounded by good agricultural land. Used for charter work and training flights. Also base for Ministry of Aviation's Civil Aviation Flying Unit fleet. A runway of 10,000 ft. already exists.
(b) Approximate distance from London.	..	30 miles direct, 36 miles by road.
(c) Access from London	..	By road: 80 minutes by A.11. By early 1970s journey time should be reducible to within an hour with the building of M.11. By rail: express trains between Liverpool Street and Bishop's Stortford take 37 minutes (20-minute frequency during rush hours, hourly or two-hourly at other times). Also semi-fast electric service taking 58 minutes (20-minute frequency during rush hours, 30-minute at other times). Further improvements to these services are planned. The present Stansted Airport is close to the Bishop's Stortford-Dunmow-Braintree branch line, and a spur or diversion to serve the airport would, it is thought, be a fairly simple and inexpensive project.
(d) Nearest towns	..	Bishop's Stortford (population 18,000) 4 miles to WSW by road.
(e) Runway possibilities	..	NE/SW parallel runways could be provided with suitable separation, using existing runway. E/W parallel runways could be provided with adequate separation. Other combinations and orientations are practicable.
(f) Compatibility with Heathrow and Gatwick.	..	With NE/SW runways 64 movements an hour would ordinarily be possible, but because of a slight conflict of approach paths with those of Heathrow there would be a loss of capacity of up to 20 inbound movements an hour at Stansted on about 10 per cent of occasions. With E/W runways 64 movements an hour would be possible. To achieve the above capacities Stansted would have to share the use of the northern air route—airway Amber One (north)—with Heathrow and other traffic, and would eventually need to have exclusive use of eastern air routes, stopping short of those to Paris.

(g) Meteorology

For aircraft with a crosswind component limit of 15 knots, usability of runways would be:

<i>NE/SW</i>	<i>E/W</i>	<i>Combined</i>
%	%	%
97.3	96.3	98.9

For aircraft with a crosswind component limit of 20 knots, usability of runways would be:

<i>NE/SW</i>	<i>E/W</i>	<i>Combined</i>
%	%	%
99.4	99.2	99.7

The annual percentages, averaged over the last four years, of hours during which visibility was less than 400 yds. and/or there was five-eighths or more cloud below 200 ft. at London's airports are:

<i>Stansted</i>	<i>Gatwick</i>	<i>Heathrow</i>
%	%	%
4.7	4.2	2.7

When Heathrow and Gatwick were both below these conditions, Stansted was above them on 29 per cent of occasions.

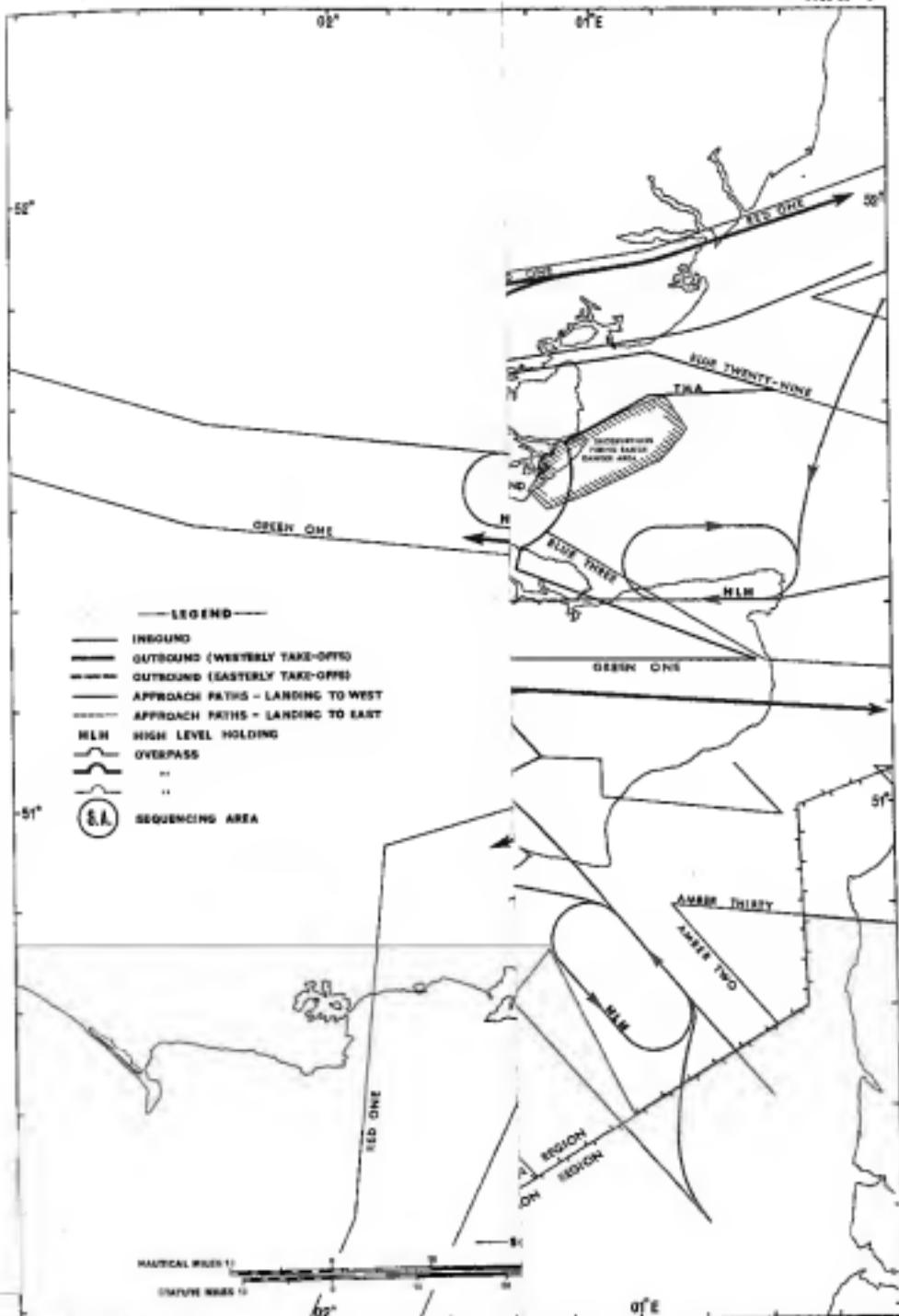
These conditions represent a reasonable basis of comparison, but it cannot be inferred that all operations would, either now or in the future, cease below these criteria.

(h) Noise problems

Parallel NE/SW runways should cause no serious noise problems.

Both E/W runways would be liable to cause some noise in Bishop's Stortford, Stansted Mountfitchet (population 3,000) and Great Dunmow (population 4,000).

Heathrow and Gatwick Traffic Flow MAP 1



PLANATORY NOTE TO MAP 5

1. Main roads in central London are the present responsibility of the London County Council. A firm programme of road improvements in this area has not yet been announced for as far ahead as the early 1970s, and the provisional completion dates we have been given assume that over the next decade the L.C.C. (and its successor—the Greater London Council) will be able to complete the road programme envisaged.

CONNEXION WITH M.11

2. The main roads from central London to the point where the Eastern Avenue extension and M.11 will intersect lie almost wholly within the L.C.C. area. The Council have plans for the comprehensive improvement of the route shown in Map 5 connecting the Eastern Avenue extension with the Western Avenue extension. The route largely follows existing roads, which will be widened as necessary to take six lanes of traffic. Between the City Road/Old Street junction and Eastway, however, there will eventually be a new road with dual three-lane carriageways, limited access and grade separation—i.e. flyovers or underpasses. The chief junctions on the rest of this route will also be given grade separation.

3. According to the present provisional programme, most of the improvements to existing roads and junctions described above will be completed by the early 1970s, but the construction of the new road between the City Road/Old Street junction and Eastway may not take place until some time after 1970.

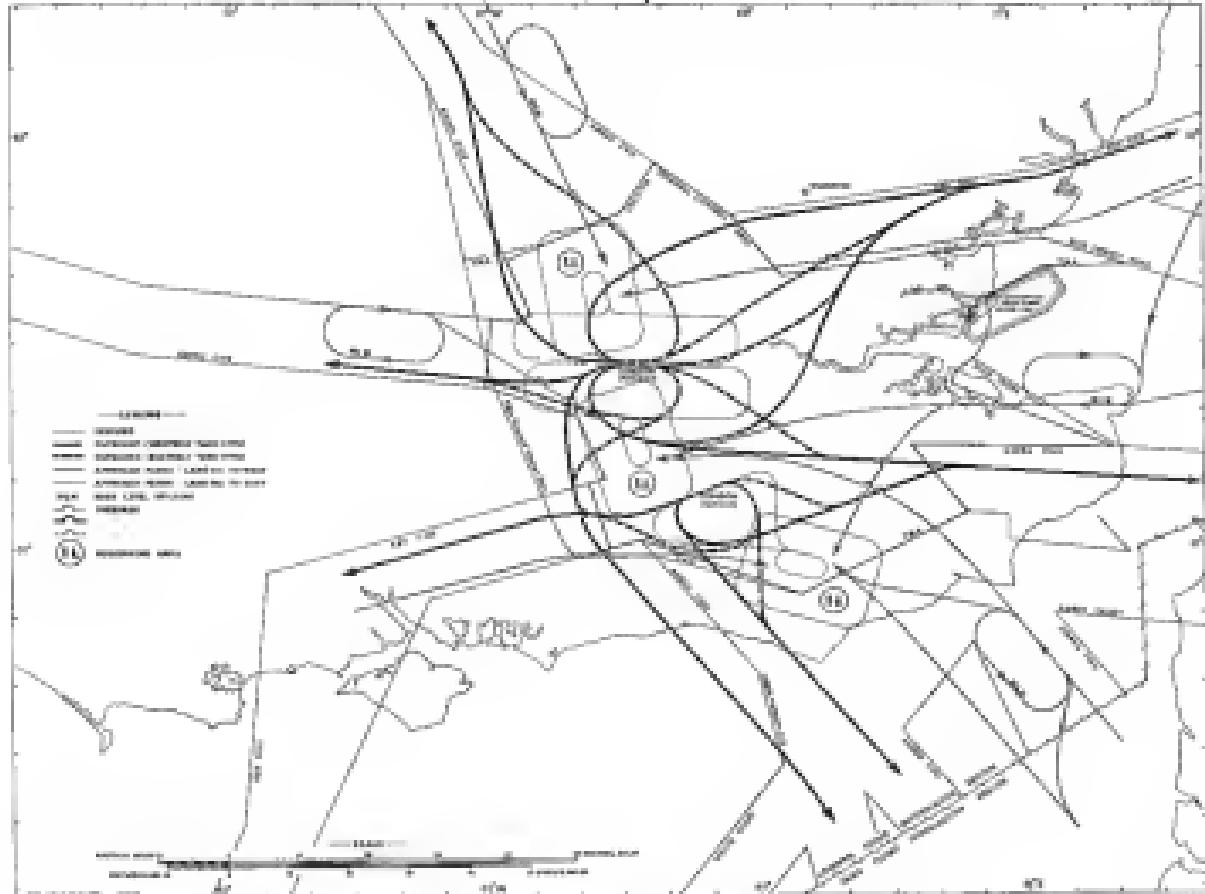
CONNEXION WITH M.4

4. The route between central London and the start of M.4 has already been improved by the completion of the Cromwell Road extension. Further improvements are proposed by the L.C.C. between Cromwell Road and Hyde Park Corner, but no firm date has been fixed for their completion.

EXPLANATORY NOTE TO MAP 6

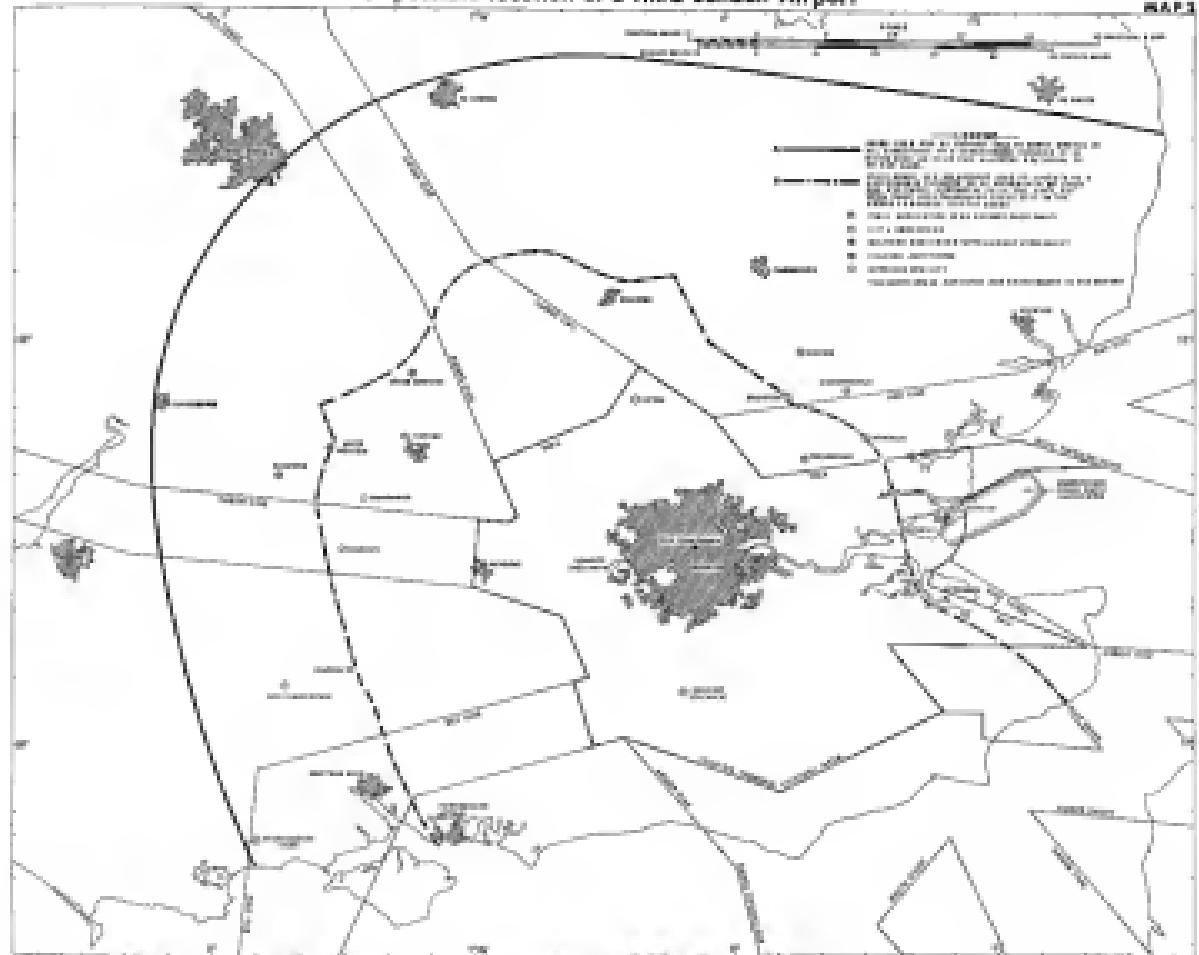
1. Map 6 shows the sort of route structure that we think will be necessary for London's air traffic when a three-airports system consisting of Heathrow, Gatwick and Stansted, is operating to full sustainable capacity, that is, Heathrow and Stansted each taking a standard busy rate of 64 movements and Gatwick 40. We have not attempted to forecast exactly when these figures will be reached, but according to the estimates in Chapter II of the report (Table I) this will not happen until after 1980.
2. These figures have been divided among the airways serving the TMA according to percentages based on those in Map 3, except that transatlantic traffic now using airway Green One (west) has been transferred to the north-western airway Amber One/Two, in order to allow for the use of Stansted by supersonic transports on transatlantic services.
3. The paired figures on the inbound and outbound air routes represent the expected maximum and minimum hourly rates of flow on these routes in busy periods. The limits have been calculated as 150 per cent and 50 per cent of the average, a variation supported by records of Heathrow's traffic during the summer of 1962.
4. It will be seen that on the inbound route to Heathrow from the south-east the expected maximum rate of flow is 24 movements an hour and this is above the maximum (i.e. 20 inbound movements an hour) which one runway is reckoned to be capable of accepting from the sequencing area. Thus when the hourly rate on this particular route rises above 20, if the route structure shown in Map 6 comes into operation, the result will be a degree of congestion; but delays from this cause should be insignificant and very few in number during the year. Similar congestion could also occur if traffic peaks on certain other inbound routes were to coincide, but this would happen even more seldom.

Heathrow and Gatwick Operating to Capacity – Possible Pattern of Air Traffic Flow



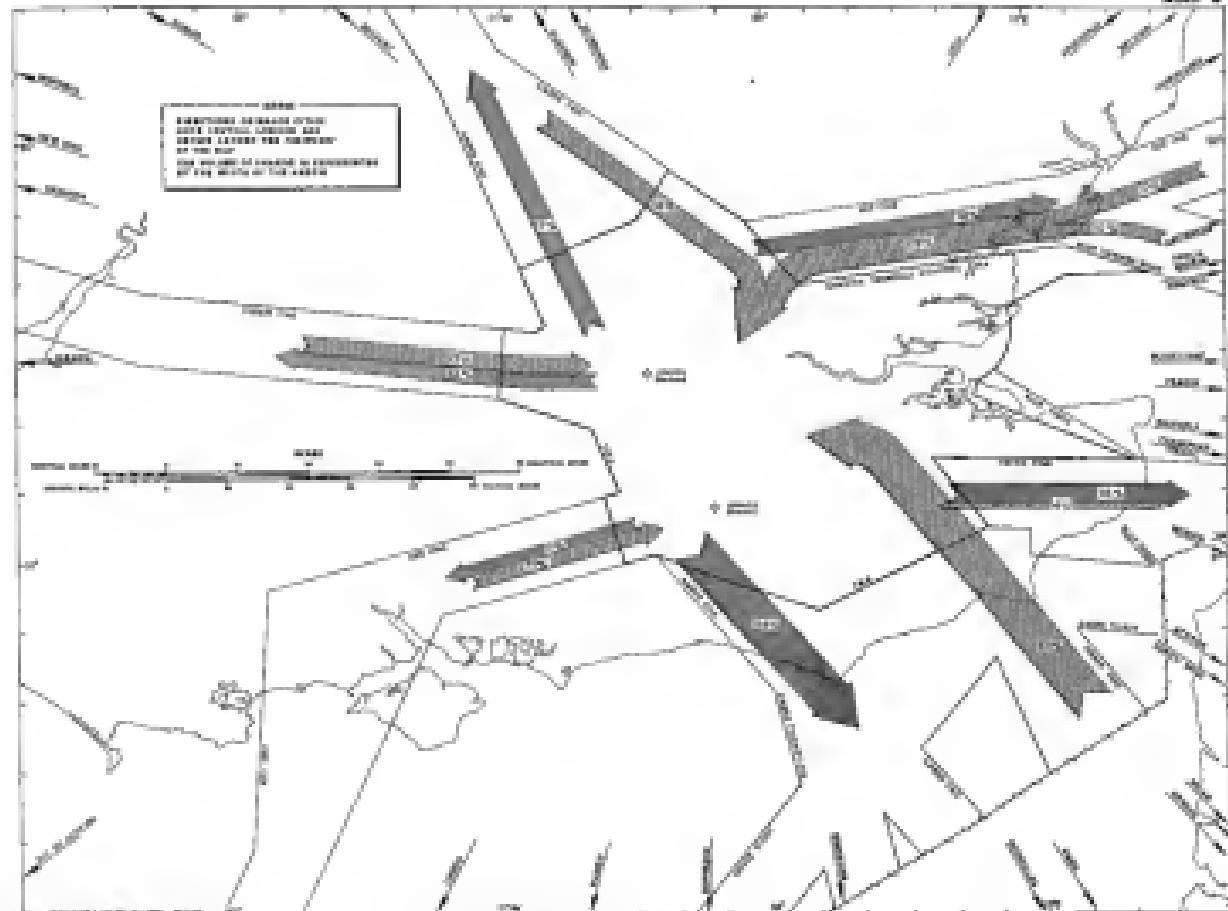
Inner limits of possible location of a Third London Airport

100



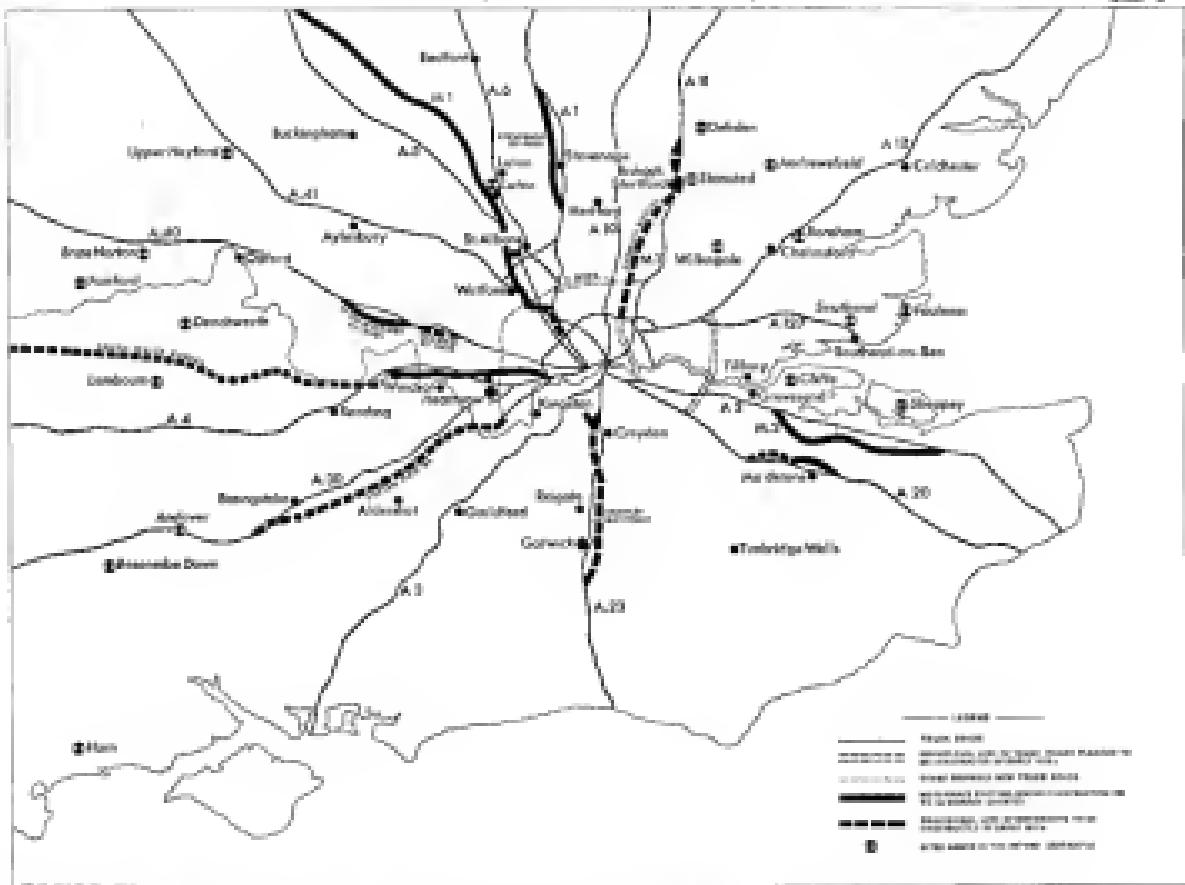
Approximate Distribution of Aircraft Movements to & from Heathrow & Gatwick,
for the week July 9th - 15th 1962

MAP 3



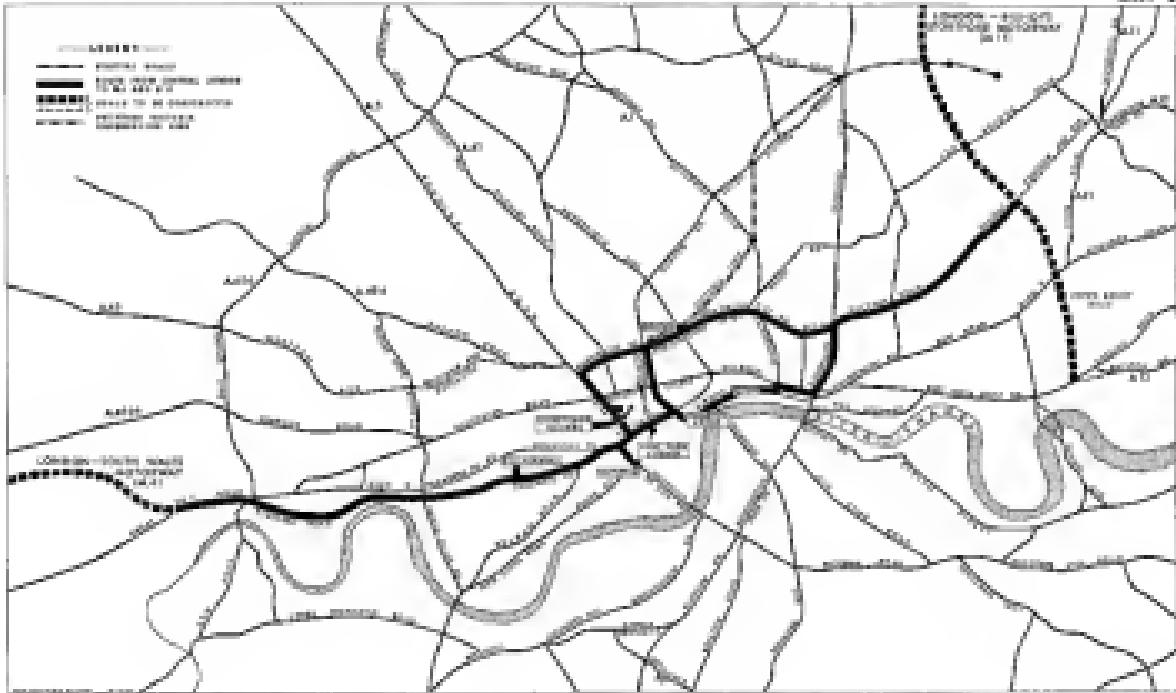
London's planned radial road system

10 of 10



Road connexions from central London to M.4 and M.11

100



Possible distribution of aircraft movements between Heathrow, Gatwick and Stansted when all three airports are operating to capacity

10

